

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
30 November 2000 (30.11.2000)

PCT

(10) International Publication Number
WO 00/72634 A1

(51) International Patent Classification⁷: **H05B 3/86, H01Q 1/12**

(21) International Application Number: **PCT/EP00/04199**

(22) International Filing Date: **1 May 2000 (01.05.2000)**

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:

99201566.9 20 May 1999 (20.05.1999) EP

(71) Applicant (*for all designated States except US*):
GLAVERBEL [BE/BE]; Chaussée de la Hulpe, 166, B-1170 Brussels (Watermael-Boitsfort) (BE).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **DEGAND, Etienne [BE/BE]; Glaverbel - Centre R. & D., Rue de l'Aurore, 2, B-6040 Jumet (BE). MAZA, Christophe [FR/FR]; Glaverbel - Centre R. & D., Rue de l'Aurore, 2, B-6040 Jumet (BE).**

(74) Agents: **FARMER, Guy et al.; Glaverbel, Intellectual Property Dept., Centre R & D, Rue de l'Aurore, 2, B-6040 Jumet (BE).**

(81) Designated States (*national*): **AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.**

(84) Designated States (*regional*): **Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).**

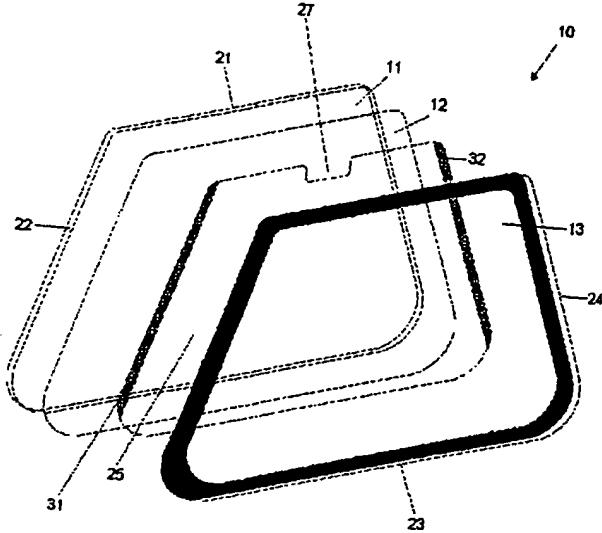
Published:

— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **AN AUTOMOTIVE GLAZING PANEL WITH SOLAR CONTROL COATING COMPRISING A DATA TRANSMISSION WINDOW**

WO 00/72634 A1



(57) Abstract: An automotive glazing panel has an electrically heatable solar control coating layer, spaced first and second bus bars positioned respectively adjacent a first and a second side edge of the glazing panel and adapted to relay electrical power to the coating layer and a data transmission window positioned adjacent the top edge of the glazing. This arrangement may be used to alleviate or reduce perturbations to heating of the glazing panel caused by the presence of the data transmission window.

AN AUTOMOTIVE GLAZING PANEL WITH SOLAR CONTROL COATING COMPRISING A DATA TRANSMISSION WINDOW

This invention relates to glazing panels and particularly but not exclusively to vehicle windscreens provided with electrically heatable coating stacks.

Whilst the primary role of a vehicle windscreen is to permit good visibility for a driver, various additional features may be incorporated into its design. Sensors or emitters arranged inside the vehicle may rely on electromagnetic data transmission through the windscreen. For example, passage of an electromagnetic data signal for automatic payment at the toll barriers used on the French motorway system may pass through the windscreen. It is also known to provide a window in the band of black enamel around the periphery of the windscreen, usually along the bottom edge of the windscreen, through which a vehicle identification number or chassis number, often in the form of a bar code, can be read from the outside of the vehicle.

US Patent N° 4,668,270 (Ford Motor Company) describes a car windscreen having an electrically heatable coating layer used for defrosting, de-icing and/or de-misting. The heatable coating, which is laminated between the two glass sheets of the windscreen, is supplied with electrical power via first and second bus bars which extend respectively along the top and bottom edges of the windscreen, each bus bar being silk screen printed on the glass in a silver ceramic material. The heatable coating is a multilayer coating consisting of layers of zinc oxide and silver formed by magnetron sputtering.

Coating layers are well known not only to provide an electrically heatable element but also to modify the optical properties of the glass, particularly to reduce the proportion of incident solar energy which is transmitted through the glass whilst allowing passage of sufficient visible light to ensure good visibility. This can reduce overheating of the interior of the vehicle in summer and is commonly achieved by reflection of incident solar radiation in the infra-red portion of the spectrum. EP378917A (Nippon Sheet Glass Co.) discloses such coating layers. The term solar control coating layer as used herein refers to a coating layer which increases the selectivity of the glazing panel i.e. the ratio of the proportion of incident visible radiation transmitted through the glazing to the proportion of incident solar energy transmitted through the glazing. Many solar control coating layers have the intrinsic property of being electrically heatable.

When a solar control coating is provided on a windscreen it is advantageous for the solar control coating to cover the entire light transmitting portion of the windscreen so as to reflect as much of the incident solar energy as

possible. A data transmission window in the form of a gap or hole may be provided in a solar reflecting coating layer specifically to allow the passage of electromagnetic waves through that portion of the glazing, for example to a sensor or emitter. One example of this, as referred to above, is to allow passage of an electromagnetic data signal for automatic payment at the toll barriers used on the French motorway system. The principle is nevertheless applicable to allowing passage of any electromagnetic data transmission signal through a glazing panel, particularly using infra-red wavelengths. The term data transmission window as used herein refers to a portion of the surface area of a glazing adapted to permit electromagnetic data transmission therethrough.

According to one aspect, the present invention provides a glazing panel as defined in Claim 1.

According to another aspect, the present invention provides a glazing panel as defined in Claim 2.

The invention allows a heatable solar control coating layer to be combined with a data transmission window in a particularly advantageous way.

The data transmission window may be substantially a four-sided polygon. Preferably, the data transmission window is not electrically coupled to an electrical element.

In one form, the data transmission window may have at least three sides surrounded by the solar control coating layer.

For aesthetic reasons and so as not to impair the driver's vision the bus bars of a heatable coating layer of a car windscreens are usually arranged out of view. It has been common practice for bus bars to be arranged along the top and bottom edges (i.e. the longer two edges of a car windscreens) hidden from the inside of the car by the dashboard and the interior bodywork and hidden from the outside by a band of black enamel (which may have the additional role of blocking solar radiation to prevent deterioration of underlying glue securing the windscreens to the car bodywork). This arrangement has been used to provide a suitable distance and thus an appropriate electrical resistance between the bus bars so as to allow a suitable electrical power to be dissipated in the coating layer to provide the desired heating effect.

Data transmission windows in solar energy reflecting windscreens have generally been arranged towards the top edge of the windscreens, roughly centrally between the two side edges. This may facilitate orientation and positioning of data transmitting and/or receiving instruments.

The inventors have appreciated that simply combining these two known techniques is undesirable as positioning of the data transmission window in close proximity to the upper bus bar results in a significant gap or non-conducting portion adjacent to the bus bar and increased risk of provoking uneven heating and

5 undesirable hot spots in the coating layer.

This problem may be resolved by the invention without requiring repositioning of the data transmission window or fundamental redesigning of either this or the bus bars.

The combination of the data transmission window with the bus bars
10 arranged along the side edges of the windscreens may significantly reduce the perturbation to the flow of electrical current in the coating layer caused by the presence of the data transmission window.

In prior art arrangements having a substantially horizontal bus bar arranged along the top edge of a windscreens, this bus bar must either be connected
15 to an electrical supply by a connector at the top edge of the windscreens or the bus bar must be brought down one side of the windscreens (avoiding contact with the electrically conducting coating layer) so as to allow arrangement of an electrical connector at the bottom edge of the windscreens. Arranging the bus bars adjacent to the side edges of the glazing may help to avoid this problem by allowing for
20 connection at or adjacent to the bottom edge of the windscreens.

Arrangement of the data transmission window in an elongate form may facilitate positioning of data transmitting and/or receiving instruments and passage of data signals. Arranging the elongation along the top or bottom edge of the glazing panel in combination with the defined bus bar arrangement enables a
25 desired surface area for the data transmission window to be selected whilst reducing the width of the interruption in the coating layer between the two bus bars. This may be used to minimise the perturbation of current flow in the coating layer when electrically heated.

The data transmission window preferably has a width comprised
30 between 50 mm and 100 mm, and a length comprised between 80 mm and 210 mm.

The data transmission window may have a width of at least 50 mm, 60 mm, 70 mm, 80 mm, 90 mm or 100 mm. It may have a width of less than 300 mm, 250 mm, 200 mm, 150 mm or 100 mm.

35 The data transmission window may have a length of at least 80 mm, 100 mm, 120 mm, 140 mm, 160 mm, 180 mm or 210 mm. It may have a length of less than 400 mm, 350 mm, 300 mm, 250 mm or 210 mm.

According to another aspect, the present invention provides a glazing panel as defined in Claim 8.

According to a further aspect, the present invention provides a method 5 of controlling heat dissipation over at least part of the surface area of an automotive glazing panel as defined in Claim 9.

An embodiment of the invention will now be described, by way of example only, with reference to Fig 1 and Fig 2, both of which are expanded schematic views of a car windscreens.

10 Windscreen 10 illustrated in Fig 1 comprises an inner sheet of glass 11 laminated to an outer sheet of glass 13 by means of a sheet of pvb 12.

The windscreen is substantially trapezial in shape having a top edge 21, a longer bottom edge 23 substantially parallel thereto and side edges 22, 24. The windscreen has a spherical, curved configuration so that it is curved both along 15 an axis parallel to the top edge 21 and along an axis perpendicular to the top edge 21 (for ease of representation the curvature of the windscreen is not shown).

An electrically conducting solar control layer 25 is positioned between the inner and outer sheets of glass 11,13. Typically this is a multi-layer coating having the general configuration antireflective dielectric layer/ silver containing layer/ 20 antireflective dielectric layer/ silver containing layer/ antireflective dielectric layer deposited by sputtering. The coating layer may be carried for example on the inner face of the outer sheet of glass 13 (i.e. face 2) or on a supporting film, for example of PET.

The coating layer 25 is spaced from the external periphery of the 25 windscreen by a non-conducting peripheral band (not shown) provided in this example by a band in which the coating layer has either not been deposited or has been removed. This prevents the electrically conductive coating extending to the very edge of the windscreen and may also reduce the risk of corrosion of the coating layer.

30 A data transmission window 27 is provided as part of the glazing panel within the coating layer. In the example of Fig 1, the data transmission window 27 is partially surrounded by the coating layer 25 but in other embodiments it may be entirely surrounded. The data transmission window may be formed by removing a portion of the coating layer or by masking when the coating layer is deposited.

35 Electrical power is supplied to the coating layer via a first bus bar 31 arranged in contact with the coating layer 25 adjacent to the first side edge 22 of the windscreen and a second bus bar 32 arranged in contact with the coating layer 25

adjacent to the second side edge 23 of the windscreens. The bus bars may be formed in any suitable manner, for example by silk screen printing of a conducting enamel material underneath or on top of the coating layer or by means of conducting tape or conductive strips, for example conductive copper or tinned copper strips.

5 Connectors (not shown) for facilitating connection of the bus bars to a car's electrical circuit may protrude from the glazing and may be arranged adjacent to each other (not shown).

In Fig 2, the data transmission window 27 is entirely surrounded by the coating layer 25.

10 Each of these arrangements may be used to allow the coating layer to cover at least the majority of the light transmitting surface of the windscreens without provoking significant perturbation in the heating arrangement of the coating layer.

Whilst the invention has been particularly described in relation to a windscreens it will be understood that it is applicable to other automotive glazing panels, for example, side windows, rear windows and sunroofs.

Claims

1. An automotive glazing panel having an electrically heatable solar control coating layer, spaced first and second bus bars adapted to relay electrical power to the coating layer and a data transmission window, in which the data transmission window is positioned adjacent the top edge of the glazing panel, the first bus bar is positioned adjacent a first side edge of the glazing panel and the second bus bar is positioned adjacent a second side edge of the glazing panel.
- 10 2. An automotive glazing panel having an electrically heatable solar control coating layer, spaced first and second bus bars adapted to relay electrical power to the coating layer and a data transmission window, in which the data transmission window is positioned adjacent the bottom edge of the glazing panel, the first bus bar is positioned adjacent a first side edge of the glazing panel and the second bus bar is positioned adjacent a second side edge of the glazing panel.
- 15 3. An automotive glazing panel in accordance with claim 1 or claim 2, in which the data transmission window is substantially elongate in shape with its elongation stretching substantially parallel to the top and/or bottom edge of the glazing panel.
- 20 4. An automotive glazing panel in accordance with any preceding claim in which the glazing panel is an automotive windscreen.
- 25 5. An automotive glazing panel in accordance with any preceding claim in which the data transmission window is at least partially surrounded by the coating layer.
- 30 6. An automotive glazing panel in accordance with any preceding claim in which the data transmission window is substantially surrounded by the coating layer.
- 35 7. An automotive glazing panel in accordance with any preceding claim in which the minimum distance between the periphery of the data transmission window and either of the first or second bus bars is at least 300 mm.

8. A glazing panel

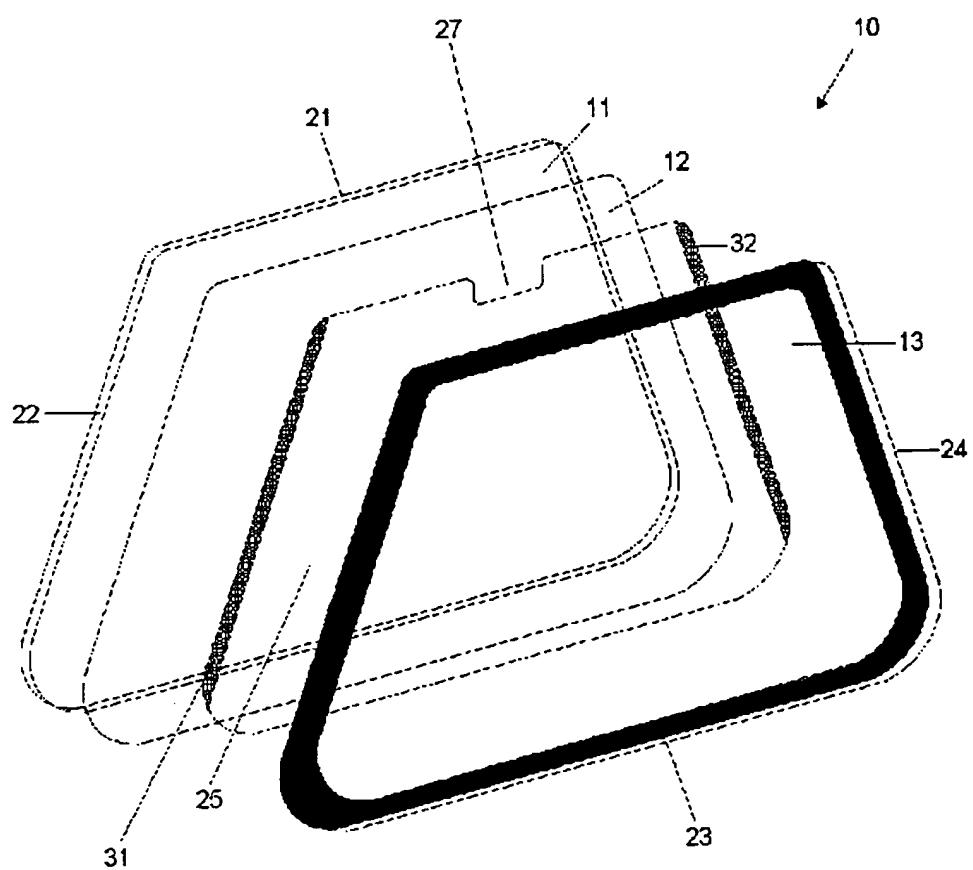
in which the glazing panel perimeter comprises at least a top edge, a bottom edge and first and second side edges, the bottom edge being longer than the top edge and substantially parallel thereto and each of the side edges being substantially the same length as each other and shorter than the top edge,
5 in which the glazing panel is provided with an electrically heatable solar control coating layer over at least part of its surface area,
10 in which the glazing panel is provided with a data transmission window adapted to permit electromagnetic data transmission therethrough,
in which the data transmission window permits transmission of a greater proportion of incident electromagnetic data than the proportion of incident electromagnetic data transmitted by an equivalently sized portion of the
15 glazing panel provided with the solar control coating,
in which the data transmission window is at least in part surrounded by the coating layer and is positioned adjacent to either the top edge or the bottom edge of the glazing panel,
in which the first bus bar is arranged substantially adjacent to and extends
20 substantially along the first side edge of the glazing panel
and in which the second bus bar is arranged substantially adjacent to and extends substantially along the second side edge of the glazing panel.

9. A method of controlling heat dissipation over at least part of the surface area
25 of an automotive glazing panel comprising use of an arrangement in accordance with any preceding claim.

10. A method in accordance with Claim 9, in which heat dissipation is controlled
30 to be substantially even over the majority of the surface area of the glazing panel.

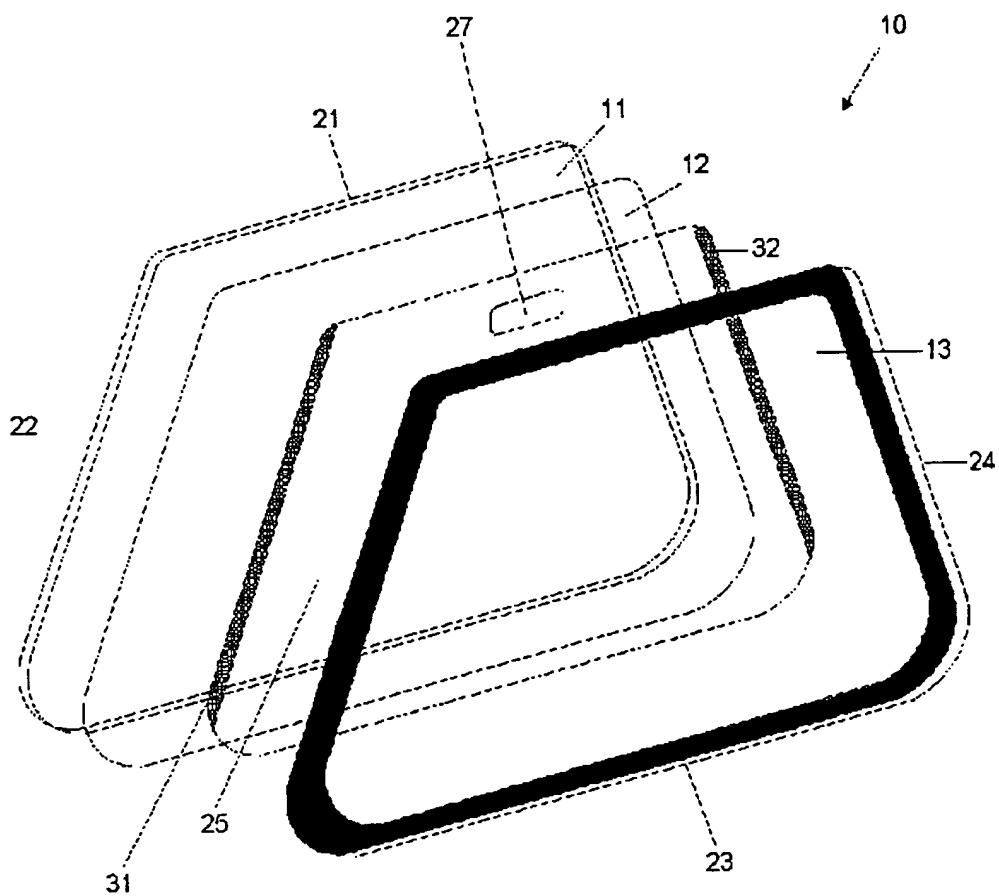
1/2

Fig 1



2/2

Fig 2



Best Available Copy

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP 00/04199

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H05B3/86 H01Q1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H05B H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 012 255 A (BECKER) 30 April 1991 (1991-04-30) the whole document ---	1,2,8
A	DE 195 13 263 A (LINDENMEIER) 10 October 1996 (1996-10-10) the whole document ---	1,2,8
A	US 5 898 407 A (PAULUS) 27 April 1999 (1999-04-27) the whole document ---	1,2,8
A	EP 0 726 232 A (SAINT-GOBAIN) 14 August 1996 (1996-08-14) the whole document ---	1,2,8
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

7 September 2000

Date of mailing of the international search report

13/09/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Taccoen, J-F

INTERNATIONAL SEARCH REPORT

Int'l. nat'l Application No

PCT/EP 00/04199

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 378 917 A (NIPPON SHEET GLASS) 25 July 1990 (1990-07-25) cited in the application ---	
A	US 4 668 270 A (RAMUS) 26 May 1987 (1987-05-26) cited in the application -----	

BEST AVAILABLE COPY

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/04199

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5012255	A	30-04-1991	DE	3808401 A	21-09-1989
			DE	58904538 D	08-07-1993
			EP	0332898 A	20-09-1989
			ES	2043914 T	01-01-1994
DE 19513263	A	10-10-1996	WO	9631918 A	10-10-1996
			EP	0764350 A	26-03-1997
US 5898407	A	27-04-1999	DE	19532431 A	06-03-1997
			AT	193619 T	15-06-2000
			DE	59605349 D	06-07-2000
			EP	0760537 A	05-03-1997
			JP	9175166 A	08-07-1997
EP 0726232	A	14-08-1996	DE	19503892 C	24-10-1996
			DE	69601819 D	29-04-1999
			DE	69601819 T	21-10-1999
			ES	2132847 T	16-08-1999
			JP	8250915 A	27-09-1996
			US	5867129 A	02-02-1999
EP 0378917	A	25-07-1990	JP	2258655 A	19-10-1990
			CA	2005634 A	16-06-1990
US 4668270	A	26-05-1987	CA	1275563 A	30-10-1990
			EP	0263582 A	13-04-1988